PLASMA DISPLAY PANEL

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] The present invention relates to a plasma display panel, and more particularly, to a plasma display panel in which a grounding method suitable for a film type front surface filter is provided.

Background of the Prior Art

[0002] A plasma display panel (hereinafter, referred to as "PDP") radiates phosphors by using an ultraviolet ray having a wavelength of 147 nm generated when mixed inert gas such as He+Xe, Ne+Xe, He+Ne+Xe and the like is discharged, so that an image including a letter or a graph is displayed thereon. It is easy to make the PDP thin and large-sized. In addition, a recent technology development attributes to an improved image quality. In particular, a three-electrode alternating current (AC) surface discharge type PDP has an advantage of a low voltage operation and a long lifetime, since wall charges are accumulated on a surface thereof at the time of discharge and electrodes are protected from a sputtering generated by the discharge.

[0003] FIG. 1 is a perspective view illustrating a structure

of a discharge cell of a conventional three-electrode AC surface discharge type PDP.

[0004] Referring to FIG. 1, the discharge cell of the three-electrode AC surface discharge type PDP includes a scan electrode Y and a sustain electrode Z formed on an upper substrate 10, and an address electrode X formed on a lower substrate 18. The scan electrode Y and the sustain electrode Z respectively include transparent electrodes 12Y and 12Z, and metallic bus electrodes 13Y and 13Z having line widths narrower than the transparent electrodes 12Y and 12Z and being formed at one-side edges of the transparent electrodes.

[0005] The transparent electrodes 12Y and 12Z are generally formed of Indium-Tin-Oxide (ITO) on the upper substrate 10. The metallic bus electrodes 13Y and 13Z are generally formed of Chromium (Cr) on the transparent electrodes 12Y and 12Z to function to reduce a voltage drop caused by a high resistance of the transparent electrodes 12Y and 12Z. An upper dielectric layer 14 and a passivation layer 16 are stacked on the upper substrate 10 in which the scan electrode Y and the sustain electrode Z are formed in parallel with each other. The wall charges generated at the time of the plasma discharge are accumulated on the upper dielectric layer 14. The passivation layer 16 prevents the upper dielectric layer 14 from being damaged due to the sputtering generated at the time of the plasma

discharge. In addition, the passivation layer 16 increases an efficiency of secondary electron emission. Magnesium Oxide (MgO) is generally used for the passivation layer 16.

[0006] A lower dielectric layer 22 and a barrier rib 24 are formed on the lower substrate 18 in which the address electrode X is formed, and a phosphor layer 26 is coated on surfaces of the lower dielectric layer 22 and the barrier rib 24. The address electrode X is formed in a crossing direction of the scan electrode Y and the sustain electrode Z. The barrier rib 24 is formed in a stripe or grid shape to prevent an ultraviolet ray and a visible ray created by the discharge from being leaked into adjacent discharge cells. The phosphor layer 26 is excited by the ultraviolet ray in the plasma discharge to generate any one of visible rays of red, green and blue. The mixed inert gas is injected into a discharge space provided between the upper/lower substrates 10 and 18 and the barrier rib 24.

[0007] In order to implement a gray scale of an image, the PDP divides one frame into several sub-fields having different radiation times and operates in a time division driving method. Referring to FIG. 2, each of the sub-fields is divided into a reset period for resetting an entire screen, an address period for selecting a scan line and selecting a cell from the selected scan line, and a sustain period for implement the gray scale depending on discharge times.

[0008] For instance, in case it is intended to display a 256 gray scale image, as shown in FIG. 2, a frame period (16.67ms) corresponding to 1/60 second is divided into eight sub-fields SF1 to SF8. As described above, each of the eight sub-fields SF1 to SF8 is divided into the reset period, the address period and the sustain period. The reset period and the address period for each of the sub-fields are the same every sub-field, while the sustain period increases at a rate of 2^n (n=0,1,2,3,4,5,6,7) in each of the sub-fields.

[0009] In the PDP that is driven as above, a front surface filter is disposed on the upper substrate 10 in order to shield an electromagnetic interference and to prevent reflection of an external light.

[0010] FIG. 3 is a schematic sectional view showing one side of the conventional PDP.

[0011] Referring to FIG. 3, the conventional PDP includes a panel 32 formed by adhering the upper substrate to the lower substrate; a front surface filter 30 disposed at a front surface of the panel 32; a heat sink 34 disposed at a rear surface of the panel 32; a printed circuit board 36 disposed to be adhered to the heat sink 34; a back cover 38 formed to encompass a rear surface of the PDP; a filter support 40 for connecting the front surface filter 30 with the back cover 38; and a support member 42 (or a front cover) disposed between the front surface filter 30

and the back cover 38 to encompass the filter support 40.

[0012] The printed circuit board 36 supplies a driving signal to the electrodes of the panel 32. For this, the printed circuit board 36 includes various driving parts (not shown). The panel 32 displays a predetermined image in response to the driving signal supplied from the printed circuit board 36. The heat sink 34 dissipates a heat that is generated from the panel 32 and the printed circuit board 36. The back cover 38 protects the panel 32 from an external impact and shields the electromagnetic interference (hereinafter, referred to as "EMI") emitted toward the rear surface of the PDP.

[0013] The filter support 40 electrically connects the front surface filter 30 to the back cover 38. The filter support 40 grounds the front surface filter 30 to the back cover 38 and also prevents the EMI from being emitted toward a lateral surface of the PDP. The support member 42 supports the filter support 40, the front surface filter 30 and the back cover 38, etc.

[0014] The front surface filter 30 shields the EMI and also prevents the reflection of the external light. For this, as shown in FIG. 4, the front surface filter 30 includes an anti-reflection coating film 50, a light-characteristic film 52, a glass 54, an EMI shield film 56 and a near infrared ray (hereinafter, referred to as "NIR") shield film 58. Herein, an adhesive layer is substantially formed between respective films

50, 52, 54, 56 and 58 of the front surface filter 30 to adhere the respective films 50, 52, 54, 56 and 58 to one another. Further, the light-characteristic film 52 is generally formed by addition of a specific material to the adhesive layer. Furthermore, the structure of the front surface filter 30 is slightly altered according to a manufacturer thereof. In the present invention, for the sake of convenience, the adhesive layer is not shown, the light-characteristic film 52 is represented as the specific layer, and the structure of the front surface filter 30 generally used is exemplified.

[0015] The anti-reflection coating film 50 prevents an external incident light from being reflected toward the external to improve a contrast of the PDP. The above-described anti-reflection coating film 50 is formed at a surface of the front surface filter 30. On the other hand, the anti-reflection coating film 50 can be additionally formed at a rear surface of the front surface filter 30. The light-characteristic film 52 decreases a brightness of red (R) and green (G) and also increases the brightness of blue (B) among an incident light from the panel 32 to improve a light characteristic of the PDP.

[0016] The glass 54 prevents the front surface filter 30 from being damaged by the external impact. In other words, the glass 54 supports the front surface filter 30 so as to prevent the front surface filter 30 from being damaged by the external impact.

The EMI shield film 56 shields the EMI to prevent an incident EMI from the panel 32 from being emitted toward the external. The NIR shield film 58 shields the NIR incident from the panel 32. The NIR shield film 58 prevents the NIR exceeding a reference value from being emitted toward the external such that transmission signals from a remote controller to the panel 32 can be normally transmitted. Meanwhile, the EMI shield film 56 and the NIR shield film 58 can be provided with one layer.

[0017] As shown in FIG. 5, the front surface filter 30 is electrically connected with the back cover 38 through the filter support 40. In more detail, the filter support 40 is connected to the rear surface of the front surface filter 30 at one side end thereof. At this time, the filter support 40 is electrically connected with at least one of the EMI shield film 56 and the NIR shield film 58. In other words, the filter support 40 connects the front surface filter 30 to the back cover 38 to thereby shield the EMI and/or the NIR.

[0018] In the conventional front surface filter 30, the glass 54 is used to prevent the front surface filter 30 from being damaged by the external impact. However, the front surface filter 30 has a disadvantage of increasing a thickness if the glass 54 is inserted into the front surface filter 30 as described above. Further, if the glass 54 is inserted into the front surface filter 30, the front surface filter 30 has a

disadvantage in that the PDP becomes heavy and a manufacture cost increase as well.

[0019] Accordingly, there has been proposed a film type front surface filter 60 in which the glass 54 is removed as shown in FIG. 6. A film type front surface filter 60 includes an anti-reflection coating film 62, a light-characteristic film 64, an EMI shield film 66 and a NIR shield film 68. Herein, an adhesive layer is formed between respective films 62, 64, 66, 68 of the film type front surface filter 60 to adhere the respective films 62, 64, 66 and 68 to one another. Additionally, a light-characteristic film 64 is generally formed by addition of the specific material to the adhesive layer. Further, a structure of the film type front surface filter 60 is slightly altered according to a using company. For the sake of convenience, the adhesive layer is not shown and the light-characteristic film 64 is represented as the specific layer.

[0020] The anti-reflection coating film 62 is formed on a surface of the film type front surface filter 60 to prevent an external incident light from being reflected toward the exterior. The anti-reflection coating film 62 can be additionally formed at the rear surface of the film type front surface filter 60. The light-characteristic film 64 decreases the brightness of red (R) and green (G) and increases the brightness of blue (B) among the incident light from the panel 32 to improve the light

characteristic of the PDP.

[0021] The EMI shield film 66 shields the EMI so that the incident EMI can be prevented from the panel 32 from being emitted toward the exterior. The NIR shield film 68 shields the incident NIR from the panel 32. The NIR shield film 68 prevents the NIR exceeding the reference value from being emitted toward the exterior such that signals can be normally transmitted from the remote controller and the like to the panel 32. Meanwhile, the EMI shield film 66 and the NIR shield film 68 can be provided with one layer.

[0022] Compared with the front surface filter 30 with the glass 54, the film type front surface filter 60 can be made thinly and lightly. Further, the film type front surface filter 60 can reduce the manufacturing cost in comparison with the front surface filter 30 with the glass 54. However, there has not been proposed a method for grounding between the film type front surface filter 60 and the filter support 40 when the film type front surface filter 60 is disposed at the PDP.

SUMMARY OF THE INVENTION

[0023] Accordingly, the present invention is directed to a plasma display panel that substantially obviates one or more problems due to limitations and disadvantages of the related art.

[0024] It is an object of the present invention to provide a

plasma display panel which is capable of providing a grounding method suitable for a film type front surface filter.

[0025] To achieve these objects and other advantages and in accordance with the purpose of the invention, as embodied and broadly described herein, there is provided a plasma display panel including: a panel; a film type front surface filter disposed at a front surface of the panel; a back cover disposed at a rear surface of the panel; a filter support having a portion formed to be overlapped with the film type front surface filter, for connecting the film type front surface filter with the back cover; a first metallic layer formed on a surface overlapped with the filter support of the film type front surface filter; and a second metallic layer disposed between the first metallic layer and the filter support, for electrically connecting the first metallic layer with the filter support.

[0026] In another aspect of the present invention, there is provided a plasma display panel including: a panel; a film type front surface filter disposed at a front surface of the panel to have a wider area than the panel; a back cover disposed at a rear surface of the panel; a filter support for electrically connecting the film type front surface filter with the back cover; a support member disposed to encompass a portion of the film type front surface filter and the filter support, and connected to the back cover; and a metallic layer formed to

encompass a surface of the film type front surface filter being not overlapped with the panel.

[0027] It is to be understood that both the foregoing general description and the following detailed description of the present invention are exemplary and explanatory and are intended to provide further explanation of the present invention as claimed.

BRIEF DESCRIPTION OF THE DRAWINGS

[0028] The accompanying drawings, which are included to provide a further understanding of the present invention and are incorporated in and constitute a part of this application, illustrate embodiments of the present invention and together with the description serve to explain the principle of the present invention. In the drawings:

[0029] FIG. 1 is a perspective view illustrating a structure of a discharge cell of a conventional three-electrode AC surface discharge type PDP;

[0030] FIG. 2 is a view illustrating a frame for representing 256 gray scales in a conventional PDP;

[0031] FIG. 3 is a schematic sectional view illustrating one side of a conventional PDP;

[0032] FIG. 4 is a schematic sectional view of a front surface filter shown in FIG. 3;

[0033] FIG. 5 is a detailed view illustrating a grounding

procedure of a front surface filter and a filter support shown in FIG. 3;

[0034] FIG. 6 is a schematic sectional view of a conventional film type front surface filter;

[0035] FIG. 7 is a sectional view of a plasma display panel according to an embodiment of the present invention;

[0036] FIG. 8 is a sectional view of a plasma display panel according to a second embodiment of the present invention;

[0037] FIG. 9 is a view of a protrusion formed at a filter support shown in FIG. 8; and

[0038] FIG. 10 is a sectional view illustrating a fixing procedure of a filter support, a film type front surface filter and a support member according to second embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0039] Reference will now be made in detail to a preferred embodiment of the present invention.

[0040] FIG. 7 is a sectional view of a plasma display panel (PDP) according to an embodiment of the present invention.

[0041] Referring to FIG. 7, the PDP according to a first embodiment of the present invention includes a panel 72 formed by adhering the upper substrate to the lower substrate and a film type front surface filter 70 disposed at a front surface of the

panel 72. A heat sink (not shown), a printed circuit board (not shown) and a back cover (not shown) formed to encompass a rear surface of the PDP are disposed at a rear surface of the panel 72. Further, the PDP according to the first embodiment of the present invention includes a filter support 74 for electrically connecting the film type front surface filter 70 with the back cover, and a support member 76 disposed between the film type front surface filter 70 and the back cover to encompass the filter support 74.

[0042] The panel 72 displays a predetermined image in response to a driving signal supplied from the printed circuit board. The heat sink dissipates a heat generated from the panel 72 and the printed circuit board. The back cover protects the panel 72 from the external impact and also shields the EMI emitted toward the rear surface of the PDP.

[0043] The filter support 74 electrically connects the film type front surface filter 70 to the back cover, and also shields the EMI emitted toward the lateral surface of the PDP. The support member 76 supports the filter support 74 and the back cover.

[0044] The film type front surface filter 70 shields the EMI emitted toward the front surface of the PDP and also prevents reflection of an external light. Further, the film type front surface filter 70 decreases a brightness of red (R) and green (G)

and also increases the brightness of the blue (B) to improve a light characteristic of the PDP. Additionally, the film type front surface filter 70 shields the NIR to prevent an erroneous operation of the remote controller. A structure of the inventive film type front surface filter 70 is the same as that of the conventional film type front surface filter 60 shown in FIG. 6.

[0045] On the other hand, an end of the filter support 74 is overlapped with an end of the film type front surface filter 70 to be electrically connected with the film type front surface filter 70. At this time, at the end of the film type front surface filter 70 overlapped with the filter support 74 is formed a first metallic layer 80. The first metallic layer 80 is electrically connected with at least one of a NIR shield film and an EMI shield film of the film type front surface filter 70. Herein, a second metallic layer 78 is disposed between the first metallic layer 80 and the end of the filter support 74. The second metallic layer 78 electrically connects the film type front surface filter 70 with the filter support 74.

[0046] In other words, in the embodiment of the present invention, the first metallic layer 80 formed on the end of the film type front surface filter 70 and the second metallic layer 78 disposed between the first metallic layer 80 and the end of the filter support 74 are used to connect the film type front surface filter 70 with the filter support 74. On the other hand,

as the second metallic layer 78, a fringe spring gasket or a shielding foam gasket being now much used as a conductive connection material can be used. Accordingly, the second metallic layer 78 is disposed in various shapes depending on a kind of the used gasket to connect the film type front surface filter 70 with the filter support 74. On the other hand, since the finger spring gasket and the shielding foam gasket have a certain elasticity, it can absorb the impact applied from the exterior to the film type front surface filter 70 to thereby prevent a damage of the film type front surface filter 70. That is, a material having the certain elasticity is selected for the second metallic layer 78 used in the present invention to connect the film type front surface filter 70 with the filter support 74, and the impact applied from the exterior is absorbed to prevent the damage of the film type front surface filter 70.

[0047] FIG. 8 is a sectional view of a plasma display panel according to second embodiment of the present invention.

[0048] Referring to FIG. 8, the PDP according to second embodiment of the present invention includes a panel 72 formed by adhering an upper substrate to a lower substrate and a film type front surface filter 88 disposed at a front surface of the panel 72. A heat sink (not shown), a printed circuit board and a back cover formed to compass a rear surface of the PDP are formed at a rear surface of the panel 72. Further, the PDP according to

second embodiment of the present invention includes a filter support 84 for electrically connecting the back cover with a film type front surface filter 88, and a support member 86 disposed between the film type front surface filter 88 and the back cover to encompass the filter support 84.

[0049] The film type front surface filter 88 is formed to have a wider area than the panel 72. Accordingly, the film type front surface filter 88 is protruded at one side toward a region besides the panel 72. That is, the one side of the film type front surface filter 88 is not overlapped with the panel 72. As described above, a metallic layer 82 is formed to encompass the one side 89 of the front filter 88 not overlapped with the panel 72. The metallic layer 82 is electrically connected with at least one of a NIR shield film and an EMI shield film. On the other hand, the metallic layer 82 is disposed between the support member 86 and the filter support 84. Herein, the metallic layer 82 is electrically connected with the filter support 84. That is, the filter support 84 is electrically connected with the film type front surface filter 88 via the metallic metal 82.

[0050] In other words, in this embodiment, the film type front surface filter 88 is large-sized more than the panel 72, and the metallic layer 82 is formed to encompass the one side 89 of the film type front surface filter 88 which is not overlapped with the panel 72, such that the filter support 84 is

electrically overlapped with the film type front surface filter 88. Accordingly, the film type front surface filter 88 can be stably connected to the filter support 84.

[0051] FIG. 9 is a view of a protrusion formed at a filter support shown in FIG. 8, and FIG. 10 is a sectional view illustrating a fixing procedure of a filter support, a film type front surface filter and a support member according to another embodiment of the present invention.

[0052] On the other hand, in the second embodiment of the present invention, as shown in FIG. 9, at a surface having the metallic layer 82 and the filter support 84 connected to each other, that is, at an end of the filter support 84 is formed a plurality of protrusions 90 such that a contact resistance can be reduced between the metallic layer 82 and the filter support 84. Additionally, in the present invention, as shown in FIG. 10, the support member 86, the metallic layer 82 and the filter support 84 can be fixed using at least one screw 92 for passing through the support member 86, the metallic layer 82 and the filter support84. Herein, the support member 86, the metallic layer 82 and the filter support 84 respectively have at least one hole (not shown) for allowing insertion of the screw 92.

[0053] As described above, the plasma display panel according to the present invention can adhere the film type front surface filter to a front surface of the panel to thereby obtain an

effect of thinning, manufacture cost reduction and weight reduction. Further, the inventive plasma display panel can stably connect the filter support to the film type front surface filter.

[0054] The forgoing embodiment is merely exemplary and is not to be construed as limiting the present invention. The present teachings can be readily applied to other types of apparatuses. The description of the present invention is intended to be illustrative, and not to limit the scope of the claims. Many alternatives, modifications, and variations will be apparent to those skilled in the art.